CLAIMS

1. A processing system for an assembly for the acquisition and matching of a stereopair of images (1, 2) which comprises an acquisition system for acquiring a stereopair of images with a stereoscopic coefficient of a few hundredths and the processing system for processing the stereopair acquired, characterized in that the processing system comprises:

- means for processing the two images (1, 2) of the stereopair in at least one processing direction and at various levels of resolutions, from the coarsest to the finest, said processing means comprising means which, for each change of level of resolution, are adapted for:

- determining, at each point in the first image (1), an optimum correlation window (3),

- computing, by correlation with the determined correlation windows, the position differences between each point (40) in the first image (1) and its radiometrically homologous (41) in the second image (2),

- obtaining, for the current level of resolution, a map of the disparities between each point (40) in the first image and its radiometrically homologous (41) in the second image, and

- carrying out a barycentric correction operation on the points on said map obtained; and

- means for obtaining, for the finest level of resolution, the map of the disparities between each point in the first image (1) and its radiometrically homologous in the second image (2).

2. The processing system as claimed in claim 1, characterized in that the means for processing the two images of the stereopair further include:

- means for convoluting the images (1, 2) of the stereopair via a convolution window; and

- means for performing a size-2 zoom on the images (1, 2) of the stereopair.

3. The processing system as claimed in claim 1 or claim 2, characterized in that the means for determining the optimum correlation window at each point in the first image comprise:

- means for computing a curvature of the first image for each correlation window size (3),

- means for computing a curvature of the noise image for each correlation window size (3), and

- means for computing, for each correlation window size, the ratio (SNRc) of the above curvatures;

and means for choosing the smallest correlation window size such that said ratio is greater than an exhaustiveness parameter input by the user.

4. The processing system as claimed in any one of the preceding claims, characterized in that the means for processing the two images further include means for performing an interpolation on the second image (2) using a disparity map obtained for the preceding level of resolution.

5. The processing system as claimed in claim 4, characterized in that the means for processing the two images further include:

- means for rejecting the homologous points (40, 41) resulting from larger correlation windows (3) and containing smaller correlation windows (3);

- means for rejecting the homologous points (40, 41) of radii of curvature that meet a rejection condition after extrapolation of the second image (2);

- means for iteratively adding, in the disparity map corresponding to the current level of resolution, missing position difference points as a function of the existing position difference points;

- means for smoothing the disparity map corresponding to the current level of resolution via a convolution window; and

- means for constructing the disparity map computed for the current level of resolution from the disparity map computed for the preceding level of resolution so as to update said disparity map computed for the preceding level of resolution.

6. The processing system as claimed in one of the preceding claims, characterized in that it further includes means for rejecting the homologous points that meet a rejection condition, said means for rejecting the homologous points comprising:

- means which, for the current point, are adapted for computing, in the first image (1), the curvatures of its two neighboring points along each processing direction;

- means which, for the current point, are adapted for computing the smaller difference of the curvatures of the four points associated with the current point in the first image (1);

- means which, for the current point, are adapted for computing, in the second image (2), its homologous point interpolated via the disparity map;

- means which, for the current point, are adapted for computing the difference between its curvature and that of the homologous point; and

- means which, for the current point, are adapted for rejecting the homologous point if this difference is greater than the computed smaller difference on the first image (1).

7. A method for matching a stereopair with a stereoscopic coefficient of a few hundredths, characterized in that it comprises the following steps:

- processing using means for processing the two images (1, 2) of the stereopair, along at least one processing direction and at various levels of

resolutions from the coarsest to the finest, by, for each change of level of resolution:

- determining, at each point in the first image (1), an optimum correlation window (3),
- computing, by correlation with the determined correlation windows, the position differences between each point (40) in the first image (1) and its radiometrically homologous (41) in the second image (2),
- obtaining, for the current level of resolution, a map of the disparities between each point (40) in the first image and its radiometrically homologous (41) in the second image, and
- performing a barycentric correction operation on the points of said map obtained; and
- generation, for the finest level of resolution, of the map of the disparities between each point in the first image (1) and its radiometrically homologous in the second image (2).

8. The method as claimed in claim 7, characterized in that it further includes the step of:

- acquisition of a stereopair of images (1, 2) using a single acquisition instrument (30) designed to operate with stereoscopic coefficients of a few hundredths and comprising two CCD sensors (31, 32) in the optical focal plane (19'), each sensor (31) allowing the acquisition of one image (1) of the stereopair.

9. The method as claimed in claim 7 or claim 8, characterized in that it includes a step consisting in processing, using processing means, the two images (1, 2) of the stereopair along an epipolar direction.

10. The method as claimed in any one of claims 7 to 9, characterized in that it includes a step consisting in processing, using processing means, the two images (1,

2) of the stereopair along an epipolar direction and a direction orthogonal to the epipolar direction.

11. The method as claimed in any one of claims 7 to 10, characterized in that it further includes a step in which a user inputs at least one exhaustiveness parameter corresponding to the choice of a correlation signal-to-noise ratio along each processing direction.

12. The method as claimed in one of claims 7 to 11, characterized in that it further includes the steps for acquisition of:

- a noise image;
- the type of correlation window;
- an epipolar direction for each image (1, 2) of the stereopair for a mean stereoscopic coefficient; and
- at least one value of the maximum position difference along each processing direction.

13. The method as claimed in claim 12, characterized in that the method further includes a data preprocessing step consisting in:

- computing a number of levels of resolution along each processing direction as a function of each value of the maximum position difference;
- filtering the images (1, 2) of the stereopair of images by convolution via a convolution window;
- filtering the noise image by convolution via said convolution window; and
- interpolating the stereopair of images in an epipolar geometry.

14. The method as claimed in one of claims 7 to 13, characterized in that the image processing step further includes the steps consisting in:

- performing a convolution on the images (1, 2) of the stereopair via a convolution window; and
- performing a size-2 zoom on the images (1, 2) of the stereopair.

15. The method as claimed in claim 11, characterized in that the step of determining the optimum correlation window consists, for each point in the first image, in:

- computing a curvature of the first image for each size of the correlation window (3);
- computing a curvature of the noise image for each size of the correlation window (3); and
- computing, for each size of the correlation window, the (SNRc) ratio of the preceding curvatures;

and in choosing the smallest correlation window size such that said ratio is greater than each exhaustiveness parameter input by the user.

16. The method as claimed in one of claims 7 to 15, characterized in that the image processing step further includes a step consisting in performing an interpolation on the second image (2) using a disparity map obtained for a preceding level of resolution.

17. The method as claimed in claim 16, characterized in that the image processing step further includes the steps consisting in:

- rejecting the homologous points resulting from larger correlation windows containing smaller correlation windows;
- rejecting the homologous radius of curvature points (40, 41) meeting a rejection condition after interpolation of the second image (2);
- iteratively adding, in the disparity map corresponding to the current level of resolution, missing position difference points as a function of the existing position difference points;
- smoothing the disparity map corresponding to the current level of resolution via a convolution window; and
- compiling the disparity map computed for the current level of resolution from the disparity map computed for the preceding level of resolution so as to

update said disparity map computed for the preceding level of resolution.

18. The method as claimed in claim 17, characterized in that the step of rejecting the homologous points meeting a rejection condition consist, for the current point, in:

- computing, in the first image (1), the curvatures of its two neighboring points along each processing direction;
- computing the smaller difference of the curvatures of the four points associated with the current point in the first image;
- computing, in the second image, its homologous point interpolated via the disparity map;
- computing the difference between its curvature and that of the homologous point; and
- rejecting the homologous point if this difference is greater than the computed smaller difference on the first image.

19. The method as claimed in one of claims 7 to 18, characterized in that the step of generating the disparity map for the finest level of resolution comprises the generation of:

- at least one table representative of the map of the disparities along each processing direction; and
- at least one table representative of a map of the correlation window sizes employed at any unrejected point in the first image, along each processing direction.

20. The method as claimed in one of claims 7 to 19, characterized in that the convolution and correlation windows used are convolution and correlation windows of the prolate type.

21. An assembly for the acquisition and matching of a stereopair of images (1, 2), comprising a system for

the acquisition of a stereopair of images and a system for processing the stereopair acquired, characterized in that the system for acquisition of the stereopair comprises a single acquisition instrument (30) comprising two CCD sensors (31, 32) in the optical focal plane, each CCD sensor (31, 32) allowing the acquisition of one image (1, 2), the acquisition system being designed to operate with stereoscopic coefficients of a few hundredths and in that the processing system comprises:

- means for processing the two images (1, 2) of the stereopair in at least one processing direction and at various levels of resolutions, from the coarsest to the finest, said processing means comprising means which, for each change of level of resolution, are adapted for:
  - determining, at each point in the first image (1), an optimum correlation window (3),
  - computing, by correlation with the determined correlation windows, the position differences between each point (40) in the first image (1) and its radiometrically homologous (41) in the second image (2),
  - obtaining, for the current level of resolution, a map of the disparities between each point (40) in the first image and its radiometrically homologous (41) in the second image, and
  - carrying out a barycentric correction operation on the points on said map obtained; and
- means for obtaining, for the finest level of resolution, the map of the disparities between each point in the first image (1) and its radiometrically homologous in the second image (2).

22. An acquisition system for an assembly for the acquisition and matching of a stereopair of images (1, 2), comprising the system for acquisition of a stereopair of images and a system for processing the

stereopair acquired, characterized in that the stereopair acquisition system comprises a single acquisition instrument (30) comprising two CCD sensors (31, 32) in the optical focal plane, each CCD sensor (31, 32) allowing acquisition of one image (1, 2) of a stereopair of images, the acquisition system being designed to operate with stereoscopic coefficients of a few hundredths.